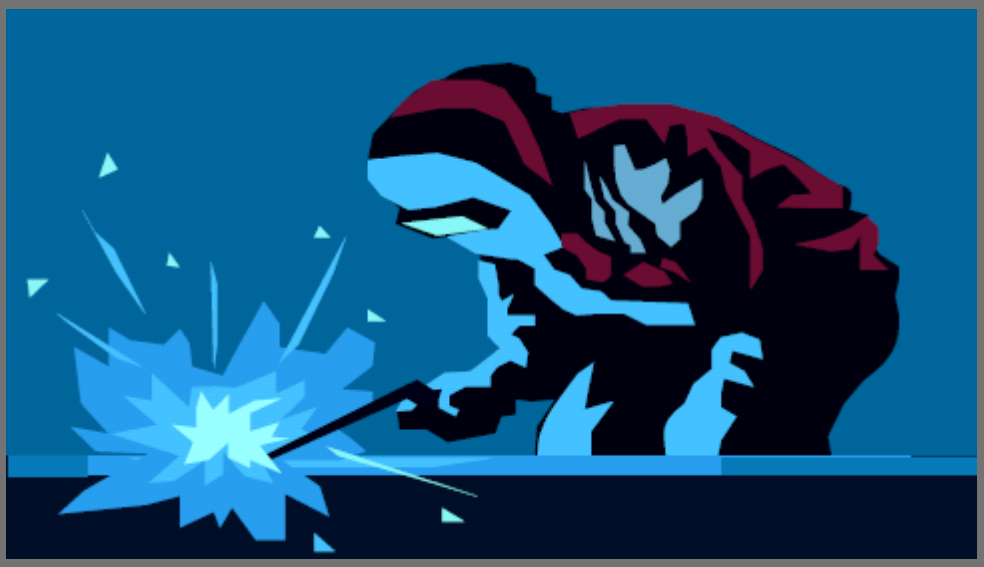
2012

Welding O.E's Kit

For New Joiners.

Welding is a Fabrication or sculptural process that joins the material, Usually Metals or thermoplastics, by causing coalescence. This is often done by melting the work pieces and adding a filler (may be and may not be) material to form a pool of molten material that cools to become a strong joint, with pressure sometimes used in conjunctions with heat, or by itself, to produce the weld. This is in contrast with soldering and brazing, which involves melting lower-melting-point materials between the work pieces to form a bond between them, without melting the work pieces.



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Contents:-

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And also sincere thanks to Miss Suriya Praba my co-worker and Project Planner for his whole Hearted support, motivation and help in making our Project Activities.

Thanks all of Guys who supported to complete this project.

Sourbh Kumar.

Introduction and Welding history

Welding is a Fabrication or sculptural process that joins the material, Usually Metals or thermoplastics, by causing coalescence. This is often done by melting the work pieces and adding a filler material to form a pool of molten material that cools to become a strong joint, with pressure sometimes used in conjunctions with heat, or by itself, to produce the weld. This is in contrast with soldering and brazing, which involves melting lower-melting-point materials between the work pieces to form a bond between them, without melting the work pieces.

Many Different energy sources can be used for welding, including a gas flame, an electric arc, a laser, an electron beam, friction, and an ultrasound.

*Until the end of 19th century, the only welding process was Forge Welding, which blacksmiths had used for centuries to join iron and steel by heating and hammering.

The History of Joining of metals goes back several millennia, called Forge welding, with the earliest examples of welding from the Bronze Age and the Iron Age in Europe and the Middle East.

Resistance Welding was developed during the final decades of the 19th Century with the first patents going to Elihu Thomson in 1885, which produced further advances over the next 15 years.

Basic work Practices

While coming to work in Shop Floor/Welding machine, ensure that you are with.

1.) Uniform
2.) Safety Shoes
3.) Safety Google's
4.) Skill Badge
5.) Gloves
6.) Ear- plug

Before start of the Shift

i.) Read the Previous shift Production log book, communication report.
ii.) Verify the Due date for the gauges with the gauge calibration Sheet, and Inform to concerned person incase of due date over.
iii.) Check the machine as per check list. Please pay attention to the check points. If any points not meeting the Requirements immediately In-form to Cell coordinator.
iv.) Ensure that no components are on the floor. If any remove and reject them.
v.) Clean the Machine, warming up the machine for 2-3 Cycles.
vi.) Ensure No Pneumatic/Hydraulic pipe Leakage, oil Spillage, Gas Leakage. If Available Arrest the Leakage and Inform to Concern Person.

During work:-

i.) Wear Suitable gloves/safety shoes/goggles wherever required.
ii.) Report any Unusual Noise/Heating/Vibration/behavior of machines.
iii.) Never by pass any safety provisions in the Machines.
iv.) Follow the Work Instruction and Work Standard as per Given.
v.) Follow first off, middle, End procedure as per standards.
vi.) Do Check the Component dimension and Machine parameters time to time.
vii.) Any Deviation in process must be approved in writing by Quality Dept. head.
viii.) Put the Rejection components in Appropriate Red bin after Marking.
ix.) Please don't keep any components, bins on the floor.
x.) Do not re-use Salvaged Components without Q.C Approval.
xi.) Ensure Clear visibility of Tags and Mark on Specific components.
xii.) Discuss any Implementation in C.I. team Activities.

Head Cap Pressing Machine

Introduction: -

Head Cap Pressing Machine Provides the simple temporary joint to head cap & piston rod by the Application of Hydraulic and Pneumatic Pressure, due to Dimension of hole in Head cap and Rod up side Having Approximately same that way whenever we forcing both on each other, Its Getting a temporary Joint.

Loading and Unloading Procedure: -

First Put the Head cap into the bottom fixture of machine, than in head cap put the rod straightly (Threaded side Up) with respect to supporting guide unit [magnetic V-type], Check for Pressure and all other Settings related to Required model than Press the Both Push button Simultaneously same time to Start the Cycle.

After Cycle Completion take out the finished component, check it for "No Gap" between the Head cap & Eye. Than Continue the process of reloading and unloading.

Inspection: - Check Gap, Pressure and Other Parameter's Time to Time.

Setup Changing Procedure:-

First Avoid Component Loaded condition,

i.) Press Function Key Select the LL (Lower Limit)

If your next Product is PA than Check out the Work Standard for Lower Limit value like is 12.2 Select it by pressing up down Key.

ii.) Than similarly select the HL (Higher Limit), set it to 13.2.

iii.) When you done Editing the LL and HL Press ok and Than Press Tare for Set the Indicator in Zero Position. Home Position.

Note:-

LVDT means "**Linear Value Differential Transform**" And don't forget to put Permanent mark on PB models Cap Inside.

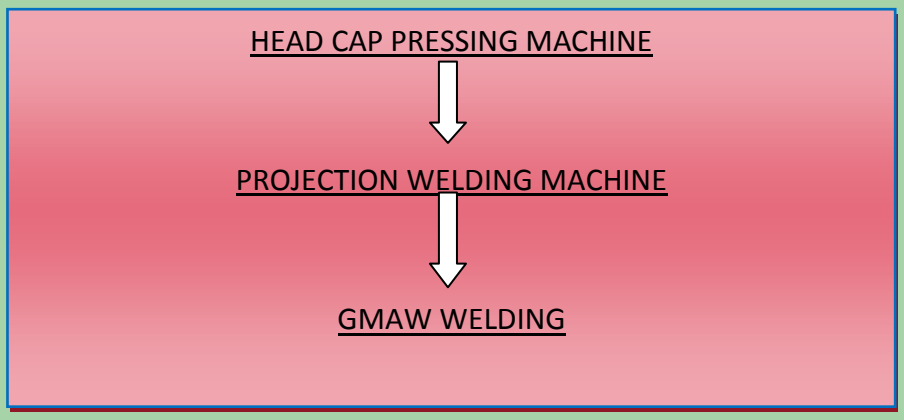
Here is Some Model and its LVDT Value, Work Standard:-

Models	LVDT
PA	12.7±0.5
PB EC	9.7±0.5
PB DOM	4.5±0.5
RBI	6.3±0.5
HA	11.6±0.5

1. Pressing Pressure:- 40-60 kg/cm²
2. LVDT: - As per Table
3. Air Pressure: - 4.5 Kg/cm²
4. Pallet condition: - No dust and Free from Extra material Like Chip etc.
5. Rod Length: - PA- 188±0.5mm

   PB- 195±0.5mm

   RBI- 194±0.5mm



Projection/Resistance Welding Machine

Introduction:-

Resistance welding involves the generation of heat by passing current through the resistance caused by the contact between two or more metal surfaces. Small pools of molten metal are formed at the weld area as high current {1000-100,00A} is passed through the metal.

In general, resistance welding methods are efficient and cause little pollution, but their applications are somewhat limited and the equipment cost can be high.

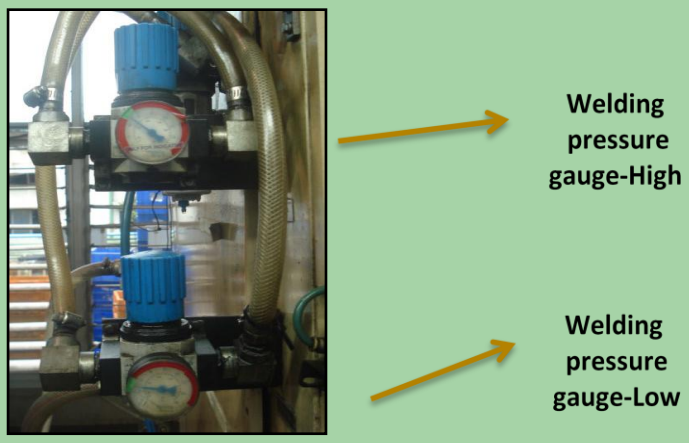
The Principal of projection welding is the joule heating law where the heat Q is generated depending on three basic factors as expressed in the following formula:

$$Q=I^2 rt$$

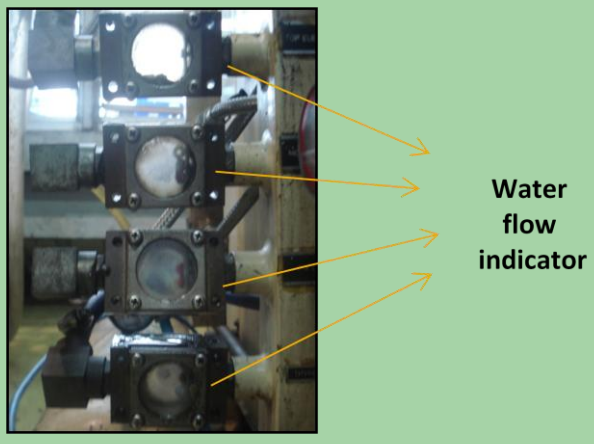
Where “I” is the Current Passing through the metal combination, “R” is the resistance of the base metals and the contact interfaces, and “t” is the duration/time of current flow.

While Startup, Things to be Follow:-

1. Check the Clamping and Welding Pressure ;(it is interlinked with machine sensors which will give alarm whenever the Pressure drops).



2. Check the Flow of Water in the Pipe line, Ball to be Rotate inside the Flow meters.



3. Check the Gap between the Head cap and Eye after pressing through the head cap pressing machine.

4. Check for Correct weld controller number, Program as Default stored in 01 Number- but for Confirmation ask to Senior O.E's or Shift In-charge.

5. Check the Working of the weld checker and the Specification.

Projection Welding Defects

ok	Not Ok	ok	Not Ok
			
Welding Gap Problem		Heat Marking Problem	

ok	Not Ok	ok	Not Ok
			
Welding Extra Material		**Eccentricity Problem**	

ok	Not ok
	
Tilt Problem	

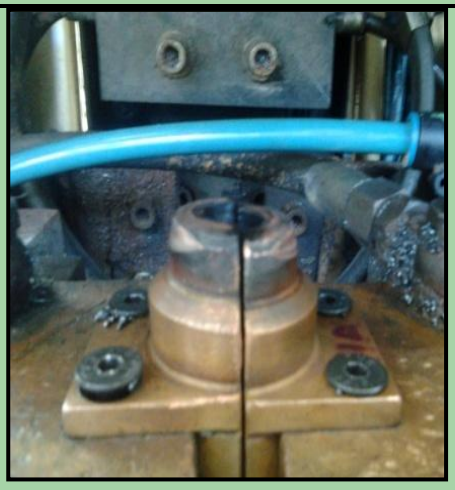
Things Need To correct when above problem occurred:-

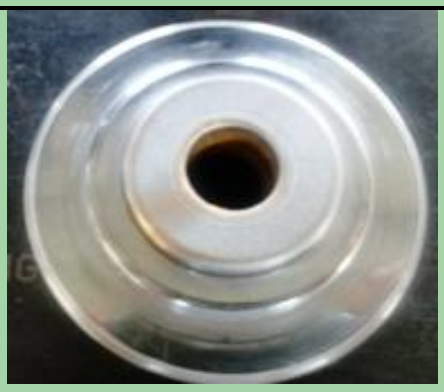
1. Gap Problem:-

Welding Gap Between Piston Rod And head Cap.	

First Check Pressing Pressure in Head Cap Pressing Machine.	
Check Presence of gap after head cap pressing.	
Set up change time bottom fixture change correctly. Cycle start in auto mode but weld should be off. After cycle completion Check for Gap.	
After Welding, Check Visually First And then measure the height of component in height gauge.	

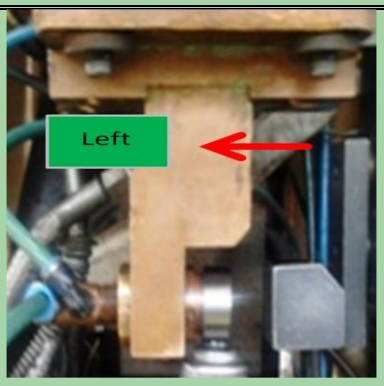
2. Tilt Problem:-

Head cap tilt problem	
*Due to clamp electrode improper alignment. *Put m/c in manual mode & check clamping position in forward condition.	
**Adjust the electrode holder up to the proper position.	

Tilt gauge	
*Cycle start & after completion check the First welded component assembly Through tilt gauge.	

3. Eccentricity Problem:

Eye eccentricity problem (Horizontal)	

Top electrode alignment problem **Put one identification mark on front side of head Assy for reference & check eccentricity	
**If eccentricity is +ve more than spec, move electrode to left side and vice versa.	
Check eccentricity	

Eye eccentricity problem (Vertically)	

**Put one identification mark on front side of head Assy for reference & check eccentricity	
**If eccentricity is +ve more than spec, move electrode to back by rotating shaft in anti-clock wise direction and vice versa.	

GAS METAL ARC WELDING MACHINE (GMAW)

Introduction:-

The Gas metal Arc welding process (GMAW), often called MIG (METAL INERT GAS), has revolutionized arc welding in this process, a Consumable Electrode (In form of wire) is fed from a spool through the torch (welding gun) at a present Controlled Speed. As the wire passes through the contact tube of the gun its picks up the welding current. The Consumable wire Electrode serves two Functions: it maintains the arc and provides filler Metal to the joint. The Method of Delivery of the filler Metal allows GMAW welding to be basically a one-handed operation.

The MIG Process uses a direct current power source, with the Electrode positive (DC, EP). By using a positive electrode, the oxide layer is efficiently removed from the Aluminium (Al) or Metal Surface, This is essential for avoiding lack of fusion and oxide inclusions.

The Metal is transferred from the filler wire to the weld bead by magnetic forces as small droplets, spray transfer. This gives a deep penetration capability of the process and makes it possible to weld in all positions. It is Important for the quality of the weld that the spray transfer is Obtained.

High rate metal Deposition result in minimum Distortion, and also GMAW offers many Advantages.

Since there is no flux, GMA welds are Clean and there is no slag to remove. GMAW enables you to produce sound welds in all positions quickly.

Gases using in GMAW welding:-

Argon:- Argon provides greater cleaning action than other gases. Because it is heavier than air, Argon blankets the weld from contamination. Also,

when you are using Argon as a shielding gas, the welding arc tends to be more stable. For this Reason, argon is often used combination with other gas.

Argon Reduces spatter by producing a quiet and reducing arc voltage that results in lower power in the arc and thus lower penetration.

Carbon Dioxide: - Argon consists of single atoms. Carbon dioxide on other hand consists of molecules. Each Molecule contains one carbon atom and two oxygen atoms. At Normal temperatures carbon dioxide is essentially an inert gas; however, at high temperatures is decomposes into carbon mono-oxide (CO) and Oxygen (O). because the Excess oxygen atoms can combine with carbon or iron in the weld metal, wires used with this gas must contain de-oxidizing Elements.

Carbon oxide is used primarily for the GMA welding of Mild Steel. Because of low cost.

Note:-

In our Company we are using the Argon and Carbon Dioxide Combination at the Ratio of 80:20.

**Argon & Carbon Dioxide Cylinder: - Yellow Color.

**Nitrogen Cylinder: - Thick Blue

Work Standard

Operating Procedure:-

i.) Check the Manufacturing condition and error proof.
ii.) Load the component to the machine.
iii.) Press Cycle Start(Pressing both Push Button simultaneously)
iv.) Unload the Component and follow Inspection Standards.
v.) Repeat the Process 2-4 After Satisfied with first Weld.

Action on Error:-

i.) Machine Error:- Inform Maintenance Team
ii.) Incoming Material error: - Inform Quality control Team.
iii.) Process Error: - Inform the Shift In-charge of Q.C Team.

Manufacturing Condition control standard: - Prefer the Work standard Available in top of Machine front.

In GMAW machine Torch Cylinder is Anode and Work Clamping/Guiding Fixture is Cathode.

GMA Welding Defects

Porosity:-

Cause:-

i.) Loss of Shielding Gas due to High Travel Speed.
ii.) Flow Rate too Low.
iii.) Flow Rate too high.
iv.) Impure gas.
v.) Non Protection of shielding gas due to wind or Draft (which is usually coming because of Leakage of Pneumatics Pipe which is used to rotate the fixtures or moving the torch tip forward and backward.
vi.) Off Countering of Filler Wire (Mis Alignment).
vii.) Excessive Current, over Heat the Electrode and losses its De-Oxidizers and alloying element (Problem in Wire).
viii.) Improper Cleaning of Base material, improper storage of filler Material.

Remedy:-

i.) Reduce the Travel Speed.
ii.) Increase/Decrease the Gas Flow Rate.
iii.) If impure gas, than use purified grade instead of Commercial Grade.
iv.) Be sure of Air Leakage, if any fix it.
v.) Adjust the Filler Wire Exactly to the Centre.

vi.) Reduce Current.
vii.) Proper cleaning of the material should be done with Chemical, Sand Paper, Brush or Scrapped.
viii.) Store the Filler Material spool in Clean Place.

Excessive Penetration:-

Cause:-

i.) Too Much Heat Generated during Welding.
ii.) Excessive Voltage.

Remedy:-

i.) Reduce the Wire speed and Increase the Travel Speed.
ii.) Check for weld parameters Like Current, Voltage and Gas flow rate.

Weld Cracking:-

Cause:-

i.) Compositional problem of filler Materials (Wire Spool not good)
ii.) Different Welding Parameters.

Remedy:-

i.) Select the proper good condition of Filler wire spool.
ii.) Clean the Fixtures/Torch Nozzle and Orifice to remove the Carbon and Extra materials deposit.

iii.) Weld with proper parameters.

Sensor's in GMA Welding Machine:-

1.) Proximity Sensor: - You clearly able to see this sensor in bottom side of machine fixture just open the bottom door and check it out. It's attached to a strip and to Guiding this Rectangular plate is attached with the Rotating Fixture.

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact.

A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor always requires a metal target.

A proximity sensor adjusted to a very short range is often used as a touch switch

2.) Optical-Fibre-Based Gas Sensor Systems: - this Sensor is placed at the bottom of control panel front Right side of machine, and use for Sensing the Amount of Gas is Flow from the Nozzle means its Generally Indicate and monitor the Amount of Gas flow, if not than Alarm coming continuously.

PERSONAL PROTECTIVE EQUIPMENT

The Projection and GMA Welding machine were using the More Amount of Current, voltage and Heat Generation. So we should and must have to use the Personal Protective Equipment for our Safety.

Here is the List of them:-

i.) **Goggles:** - In welding machine (Especially projection) Emit more sparks and Smoke which is not good for our Eyes, so we must have to use this PPE.

ii.) **Mask:** - As we well know that, Wherever the Term Welding Employed means Smoke must be there, so To Ensure prevention of Health Hazard we must have to Wear Mask While Working with/In Welding Machine.

iii.) **Gloves:** - Due to Welding is an application of Heat and Electricity that way must needs to Wear Gloves to protect ourselves from Burning and Electrical shock. For Welding a special type of Gloves is Available ask for it.

iv.) **Ear Plug:** - In our company the welding machine is placed just near to the Compressor Unit, so "I suggest Using the Ear Plug". But this is Just our Choice to use it or not.

v.) **<u>Safety shoes</u>:** - While coming to Machine Shop floor, you are working or not matter should and must wear the Safety shoes to avoid the Accident Related to Falling Heavy/Sharp Component in your Legs.

Note: - All girls must tie their hair properly for Safety Purpose.

My Notes:-

Q. Why Rejection Can Happen?

Ans: - 1.Operator By Passed The Process.

2. Basics Work Practices Are Not Followed.

3. Initial Inspection Not Carried

4. Lack of Concentration.

**Lists Of Welding Quality Issues:-

a. Gap Problem
b. Eccentricity Problem
c. Tilt Problem
d. Heat Marking
e. Extra Material
f. Weld Spatter Problem

**When above Problem Occurs?

i. Improper Height Adjustment During setup change.
ii. Bottom Fixture not tightened properly.
iii. Initial Inspection Not Carried.
iv. Lack of Concentration,
v. Electrode Not Dressed Properly.
vi. Water Circulation Problem.
vii. Clamp Electrode Alignment Problem.
viii. Top Electrode Alignment Problem.
ix. Due to Improper Cooling Of electrode.

AWARNESS PROGRAM FOR PROJECTION WELDING MACHINE

When rejection can happen?

1) Operator bypassed the Process.
2) Basic work practices are not followed.
3) Initial inspection not carried.
4) Lack of concentration

**Things need to Verify during the abnormal situation like power off/while process/ while startup of machine.

1. While Process: - Like power cut During the Cycle time!!

Ans:-

i. Remove the component and put in Rejection bin.
ii. Check the Inner Surface and Outer Edge of the Electrode for any burr and uneven face.
iii. Check the Height of Electrode.

Rejection Bin

Electrode's

2. After Every Break time, we have to do Bending test, if any Problem coming means what we do.

Ans:-

i. Incase of weld broken without the parent material stop the Production.
ii. Every one hour needs to do bending test.

Not ok

Ok

3. Reject the component In following Condition:-

Ans:-

i. Heat Mark coming/Black Mark coming.
ii. Gap Presence between Head cap & Eye.
iii. Spatter in Rod.
iv. Spiral mark in rod.

4. Things to Check in Regular Based.

Ans:-

i. Weld parameter must be with in Specification.
ii. Check the air Pressure time to time.
iii. Don't use the Disk below the Bottom jig, Spacer has to be use for PB – 6.2mm, and for PA – 6.8mm.
iv. Check Water flow in Machine Line.

Note: - If any Variation Coming During the Work than Kindly inform to Senior O.E's or to shift in charge.

Pneumatic systems

Most pneumatic circuits run at low power -- usually around 2 to 3 horsepower. Two main advantages of air-operated circuits are their low initial cost and design simplicity. Because air systems operate at relatively low pressure, the components can be made of relatively inexpensive material -- often by mass production processes such as plastic injection molding, or zinc or aluminum die-casting. Either process cuts secondary machining operations and cost. First cost of an air circuit may be less than a hydraulic circuit but operating cost can be five to ten times higher. Compressing atmospheric air to a nominal working pressure requires a lot of horsepower. Air motors are one of the most costly components to operate. It takes approximately one horsepower to compress 4 cfm of atmospheric air to 100 psi. A 1-hp air motor can take up to 60 cfm to operate, so the 1-hp air motor requires (60/4) or 15 compressor horsepower when it runs. Fortunately, an air motor does not have to run continuously but can be cycled as often as needed. Air-driven machines are usually quieter than their hydraulic counterparts. This is mainly because the power source (the air compressor) is installed remotely from the machine in an enclosure that helps contain its noise. Because air is compressible, an air-driven actuator cannot hold a load rigidly in place like a hydraulic actuator does. An air-driven device can use a combination of air for power and oil as the driving medium to overcome this problem, but the combination adds cost to the circuit. (Chapter 15 has information on air-oil circuits.)Air-operated systems are always cleaner than hydraulic systems because atmospheric air is the force transmitter. Leaks in an air circuit do not cause housekeeping problems, but they are very expensive. It takes approximately 5 compressor horsepower to supply air to a standard hand-held blow-off nozzle and maintain 100 psi. Several data books have charts showing cfm loss through different size orifices at varying pressures. Such charts give an idea of the energy losses due to leaks or bypassing.

Hydraulic systems

A hydraulic system circulates the same fluid repeatedly from a fixed reservoir that is part of the prime mover. The fluid is an almost non-compressible liquid, so the actuators it drives can be controlled to very accurate positions, speeds, or forces. Most hydraulic systems use mineral oil for the operating media but other fluids such as water, ethylene glycol, or synthetic types are not uncommon. Hydraulic systems usually have a dedicated power unit for each machine. Rubber-molding plants depart from this scheme. They usually have a central power unit with pipes running to and from the presses out in the plant. Because these presses require no flow during their long closing times, a single large pump can operate several of them. These hydraulic systems operate more like a compressed-air installation because the power source is in one location.

A few other manufacturers are setting up central power units when the plant has numerous machines that use hydraulics. Some advantages of this arrangement are: greatly reduced noise levels at the machine, the availability of backup pumps to take over if a working pump fails less total horsepower and flow, and increased uptime of all machines.

Another advantage hydraulic-powered machine has over pneumatic ones are that they operate at higher pressure -- typically 1500 to 2500 psi. Higher pressures generate high force from smaller actuators, which means less clutter at the work area.

The main disadvantage of hydraulics is increased first cost because a power unit is part of the machine. If the machine life is longer than two years, the higher initial cost is often offset by lower operating cost due to the much higher efficiency of hydraulics. Another problem area often cited for hydraulics is housekeeping. Leaks caused by poor plumbing practices and lack of pipe supports can be profuse. This can be exaggerated by overheated low-viscosity fluid that results from poor circuit design. With proper plumbing procedures, correct materials, and preventive maintenance, hydraulic leaks can be virtually eliminated. Another disadvantage could be that hydraulic systems are usually more complex and require maintenance personnel with higher skills. Many companies do not have fluid power engineers or maintenance personnel to handle hydraulic problems.

Conclusion

This Project Aims at Introducing Welding Technology to the New Joiners to make it easy to Understand and work on machine. In An Entirely Different Way That Has Been Little Distant Till Now. But The Pace In Which The People were Interested in Welding Process, This Seems That Very Soon; We Will Be In An Environment of Pervasive Automated Welding Technology In Manufacturing Field. Where the Human and Machine Will Be Interact In the Informal Way, the Way in Which human Communicate with Each Other.

References:-

Many Texts Have Been Referred While Doing Work on Project Entitled of "Welding Process New O.E's Kit". Following Is the List of Them:-

1.) Course material by Foreman Training Institute.

2.) Google Search.

3.) Work piece Image Credited by J.p sir and Anita Miss.

4.) My Notes any Training material provided by Mando India Ltd.

Thanks

Head Assy Welding